

IN THE CLAIMS:

1 1. (Cancelled) An apparatus that provides at least one estimated effective age of
2 a product during the entire life of the product, comprising:
3
4 at least one sensor equipped on the product that provides data about
5 an environmental condition;
6
7 a device equipped on the product that uses said data to calculate an
8 age acceleration factor for said product for at least one of said sensors;
9
10 at least one accumulator equipped on the product that provides the
11 estimated effective age for said product, based upon said age acceleration
12 factor; and
13
14 a display equipped on the product capable of presenting said
15 estimated effective age to a user of said product.

1 2. (Cancelled) The apparatus of claim 1, wherein said sensor includes an analog
2 to digital conversion function, and wherein said device that uses said data to
3 calculate an age acceleration factor is a digital processor.

1 3. (Currently Amended) An apparatus that provides at least one estimated
2 effective age of a product during the entire life of the product, comprising:
3
4 at least one sensor equipped on the product that provides data about
5 an environmental condition, the sensor further includes an analog to digital
6 conversion function;
7
8 a device equipped on the product that uses said data to calculate an
9 age acceleration factor for said product for at least one of said sensors, said
10 device is a digital processor programmed to use said data to calculate an
11 Arrhenius estimation of said age acceleration factor;
12
13 at least one accumulator equipped on the product that provides the
14 estimated effective age for said product, based upon said age acceleration
15 factor; and

13 a display equipped on the product capable of presenting said estimated
14 effective age to a user of said product.

15 The apparatus of claim 2, wherein said digital processor is programmed to
16 compute an Arrhenius estimate of said age acceleration.

- 1 4. (Cancelled) The apparatus of claim 2, wherein said digital processor is
2 programmed to compute a Coffin-Manson estimate of age acceleration.
- 1 5. (Cancelled) The apparatus of claim 2, wherein said digital processor is
2 programmed to compute a Hallberg-Peck estimate of age acceleration.
- 1 6. (Cancelled) The apparatus of claim 2, wherein said accumulator is at least
2 partially implemented in nonvolatile storage.
- 1 7. (Cancelled) The apparatus of claim 6, wherein said nonvolatile storage is a
2 ferroelectric memory.
- 1 8. (Cancelled) The apparatus of claim 6, wherein said nonvolatile storage is a
2 flash memory.
- 1 9. (Cancelled) The apparatus of claim 6, wherein said nonvolatile storage is a
2 hard disk.
- 1 10. (Cancelled) The apparatus of claim 6, wherein said nonvolatile storage is a
2 volatile memory element, with continuity of power provided by a battery.
- 1 11. (Cancelled) The apparatus of claim 1, wherein said sensor produces an
2 analog voltage output, said analog voltage output varying substantially
3 linearly responsive to a change in temperature, wherein said voltage output is
4 said data.
- 1 12. (Currently Amended) An apparatus that provides at least one estimated
2 effective age of a product during the entire life of the product, comprising:

3 at least one sensor equipped on the product that produces data in the
4 form of an analog voltage output that varies substantially linearly responsive

5 to a change in temperature;

6 a device equipped on the product that uses said data to calculate an
7 age acceleration factor for said product for at least one of said sensors, said
8 device is a VCO, said VCO producing a VCO output signal having a
9 frequency that varies substantially exponentially responsive to a linear
10 voltage change on an input of the VCO;

11 at least one accumulator equipped on the product that provides the
12 estimated effective age for said product, based upon said age acceleration
13 factor; and

14 a display equipped on the product capable of presenting said estimated
15 effective age to a user of said product.

16 ~~The apparatus of claim 11, wherein said device that uses said data to calculate an age~~
17 ~~acceleration factor for said product is a VCO, said VCO producing a VCO output~~
18 ~~signal having a frequency that varies substantially exponentially responsive to a~~
19 ~~linear voltage change on an input of the VCO.~~

1 13. (Previously presented) The apparatus of claim 12, wherein said accumulator
2 is a counter; said counter being implemented, at least in part, in a nonvolatile
3 or effectively nonvolatile technology, and wherein said counter is clocked by
4 the VCO output signal.

1 14. (Original) The apparatus of claim 13, wherein said display is electrically
2 coupled to selected bits of said counter.

1 15. (Cancelled) A method for producing one or more estimates of effective age
2 of a product, during the entire life of the product, comprising the steps of:

3 sensing, using a sensor equipped on the product one or more
4 environmental conditions;

5 computing, using a computer equipped on the product, an age
6 acceleration factor for each of the environmental conditions sensed, using a
7 model that relates the environmental condition to the age acceleration factor;

8 computing, using the computer equipped on the product, effective age
9 values, using said acceleration factors;

10 storing, using a storage equipped on the product, said effective age
11 values into nonvolatile storage; and

12 displaying, using a display equipped on the product, said effective age
13 values to a user of said product on a display.

1 16. (Cancelled) The method of claim 15, wherein the step of computing an age
2 acceleration factor comprises the use of the Arrhenius equation, the Hallberg-
3 Peck equation, or the Coffin-Manson equation.

1 17. (Cancelled) The method of claim 15, wherein the step of computing effective
2 age values further comprises the steps of:

3 time integrating the age acceleration factor for each of the
4 environmental conditions sensed, resulting in an effective age for the product
5 according to each said model;

6 computing a normalized effective age for some or all of the effective
7 ages by dividing the instant effective age by a wall clock age;

8 computing an effective life used value for some or all of the effective
9 ages by dividing the instant effective age by a predetermined estimate of life
10 of the product; and

11 computing an effective life remaining value for some or all of the
12 effective ages by subtracting said effective life used value from “1”.

1 18. (Cancelled) The method of claim 15, wherein the step of displaying said
2 effective age values further comprises the steps of:

3 determining if any of said values are outside of predetermined ranges;
4 and

5 alerting the user if any of said values are outside of predetermined
6 ranges by lighting a light, sounding an audible alarm, or presenting said
7 values on said display.

1 19. (Previously presented) An apparatus that provides at least one estimated
2 effective age of a product comprising:

3 at least one sensor that provides data about an environmental
4 condition;

5 a device that uses said data to calculate an age acceleration factor for
6 said product for at least one of said sensors;

7 at least one accumulator that provides the estimated effective age for

8 said product, based upon said age acceleration factor; and

9 a display capable of presenting said estimated effective age to a user

10 of said product;

11 wherein the at least one sensor includes an analog to digital conversion

12 function, and wherein said device that uses said data to calculate an age

13 acceleration factor is a digital processor wherein said digital processor is

14 programmed to compute a Hallberg-Peck estimate of age acceleration.

20. (Previously presented) A method for producing one or more estimates of effective age of a product, comprising the steps of:

- sensing one or more environmental conditions;
- computing an age acceleration factor for each of the environmental conditions sensed, using a model that relates the environmental condition to the age acceleration factor;
- computing effective age values, using said acceleration factors;
- storing said effective age values into nonvolatile storage; and
- displaying said effective age values to a user of said product on a display;

wherein the step of computing an age acceleration factor comprises the use of the Arrhenius equation, the Hallberg-Peck equation, or the Coffin-Manson equation.

3 sensing one or more environmental conditions;

4 computing an age acceleration factor for each of the environmental
5 conditions sensed, using a model that relates the environmental condition to
6 the age acceleration factor;

7 computing effective age values, using said acceleration factors;

8 storing said effective age values into nonvolatile storage; and

9 displaying said effective age values to a user of said product on a
10 display;

11 wherein the step of computing effective age values further comprises the
12 steps of:

time integrating the age acceleration factor for each of the environmental conditions sensed, resulting in an effective age for the product according to each said model;

16 computing a normalized effective age for some or all of the effective
17 ages by dividing the instant effective age by a wall clock age;

computing an effective life used value for some or all of the effective ages by dividing the instant effective age by a predetermined estimate of life of the product; and

computing an effective life remaining value for some or all of the effective ages by subtracting said effective life used value from "1".